Light and Lighting

Vol. XLV.—No. 5. May, 1952 One Shilling and Sixpence

Contents

	Page
Editorial	153
Notes and News	154
Lighting in the Wool Textile Industry	157
Lighting in the Manufacture of Mica Tape	164
The Physical Society Exhibition	167
Recent Street Lighting Installations	171
Lighting in an Irish Linen Factory	174
Trade Notes	177
Correspondence	179
Reviews of Books	181
I.E.S. Activities	183
Postscript	186
Index to Advertisers ...	xviii

Published monthly by the Illuminating Engineering Publishing Co., Ltd., at 32, Victoria St., London, S.W.1. Telephone ABBey 7553. Subscription rate £1 per annum.

The official journal of the Illuminating Engineering Society.

"Brightness Engineering"

THE programme for the forthcoming Summer Meeting of the Illuminating Engineering Society shows that the subject of "brightness engineering" will loom largely in the technical sessions. It is to be hoped that the "clerk of the weather" will see to it that brightness abounds at Eastbourne during the period of the meeting, so as to brighten the spirits of those who will be discoursing on desirable brightness levels and brightness ratios, as well as of those who go to listen. The number of papers published on aspects of brightness engineering is growing apace—particularly on the other side of the Atlantic. But, is it not already out of date to speak of "brightness" engineering? Conformity with approved terminology would seem to demand a change to "luminance engineering," and it remains to be seen whether this innovation will be introduced. Moreover, if brightness or luminance engineering is to supersede illuminating engineering, should we not expect that, ere long, the I.E.S. will become the B.E.S. or the L.E.S.?

Notes and News

Transparent Conducting Films

One does not readily associate transparency with any appreciable degree of electrical conductivity. We are assured, however, that some metals like gold for instance, in the form of a thin enough film, would combine the two to a remarkable degree, if only the metal retained its bulk physical properties when so thin. Unfortunately it seems that it never does so, so that where thin films are concerned, it may be excelled in this respect by a more transparent but poorly conducting material, in an appreciably thicker, but still very thin, film or layer.

News comes from the Light Division, N.P.L., of which Dr. L. A. Sayce is superintendent, of a new process for making such films, evolved by a well-known life-member of the I.E.S., Mr. V. S. Preston. From a tin electrode, a layer of partially oxidised tin is deposited on a glass strip, using the gas-discharge process known as sputtering (which is the same, we believe, as that which eventually blackens the ends of discharge lamps). The glass is then heated to promote further controlled oxidisation, and the result is a transparent film with relatively good electrical conductivity, adhesion, and durability. The film is identified, though perhaps not with complete certainty, as stannic oxide—a material more familiar as a white powder. It has the same property of great resistance to chemical attack, even by strong acids and alkalis.

The films so far produced have a resistance, per square, of 1,000 ohms, with a light loss of perhaps 10 to 15 per cent. Further development to lower the resistance would thus seem necessary before the films could be used for de-misting of windscreens or shop-windows by heating them on an electric supply of convenient voltage. There is also the problem of scaling up an unfamiliar production process to cope with large sheets of glass. In the present form, however, the process has a number of useful scientific applications such as the provision of non-insulating glass windows for delicate electrical instruments, where the chance accumulation of a static charge on an ordinary glass window is not infrequent, and can give rise to erroneous readings.

In the United States, similar so-called Nesa films are produced on a commercial scale, and with lower resistance. Mr. Preston does not at present claim to have improved on this, but to have discovered an alternative process which also has the advantage that it can produce films of a wide variety of types and materials. Some, we gather, have greatly improved properties, and we shall no doubt be hearing more of them in due course. Mr. Preston broadcast a short account of this work in "Radio Newsreel" on the Light Programme, on Monday, March 10.

Colour Tolerance in Colour Photography

The Annual General Meeting of the Physical Society Colour Group was held on March 26, when the committee presented a very encouraging report on the activities of the Group during the past session. Dr. Vickerstaff was re-elected chairman for a second year but a new secretary was appointed, Mr. R. W. G. Hunt taking the place of Mr. R. G. Horner, while Dr. S. T. Henderson and Dr. Katherine Tansley replaced Mr. C. G. A. Hill and Dr. E. N. Willmer on the committee.

There was a very good attendance, no doubt partly due to wide interest in the subject of the papers presented at the

ordinary meeting which immediately followed the A.G.M. These papers were given respectively by the new secretary and by the retiring secretary and both had to do with the extent to which we overlook imperfections in the colour rendering of objects in colour photography. Mr. Hunt, of Kodak, Limited, whose paper was entitled "The Subjective Appraisal of Colour Photographs," set himself to answer the question "How does a colour photograph get away with it?" In other words, why is it that we accept as a satisfactory representation a photograph in which the colours, when analysed, are found to be quite markedly different from those of the objects represented?

All modern processes of colour photography, said Mr. Hunt, desaturate practically every colour that they reproduce, and he gave a striking demonstration of this by means of a series of photographs of colour filters. In spite of this physical desaturation, however, the subjective appearance of most colours in a colour photograph is quite satisfactory and sometimes the colours appear to be even more saturated than they should be. The author's suggested explanation was that, in appraising the colour of an object in a colour photograph, the standard of colour against which it was judged consisted of a conception in the memory of the actual colours of similar objects and this conception was, in most cases, necessarily vague. As he pointed out, the colour of any given type of object varies over a wide range and, further, not only does the physical colour vary but the circumstances in which the objects are seen also vary widely so that the subjective impression formed on the memory is far from definite. He illustrated these points by photographs of a fire alarm seen on an ordinary sunny day and on a grey day with snow on the ground so that the lighting was very diffused and the colour greatly desaturated in consequence.

Our conception of the usual colours of objects being so vague, said Mr. Hunt, the desaturation unavoidable in colour photography passes unnoticed and the fact that what we are looking at is not merely a collection of patches of colour, but a picture with artistic and emotional appeal, tends further to obscure such imperfections in the reproduction.

The second paper, by Mr. R. G. Horner, of Ilford, Limited, was entitled "The Visual Interpretation of Characteristic Curves in Colour Photography." The author showed a number of graphs in which the characteristic (exposure/density) curves for the three colours used in colour photography were given for a large variety of colour films. It was seen that the curves departed to a greater or less extent, and in different ways, from the ideal in which all three colour curves would be exactly superimposed and have a long straight portion with a gamma of about 1.3. The effects of the different types and degrees of departure from this ideal condition were shown by means of a large number of sets of colour photographs taken on the different films; in many cases, the effect of varying the exposure was also shown.

I.E.S. Summer Meeting

Soon after the appearance of this issue of the journal I.E.S. members and friends will be gathering at Eastbourne for the third of the biennial summer meetings. It is apparent that there will be good attendances at the technical sessions and at the social events. It is not too late for those who have not yet indicated their intention to be present at Eastbourne to register. Those who cannot be present for the whole meeting may attend for part of the meeting or for single days only.

The papers by Dr. Stiles and Mr. Logan are of particular importance at the present time and the discussions should be of great value. We gather that Mr. Kalff in his address will put forward his views on the achievement of comfortable lighting conditions; this should give us further food for thought.

An interesting example of shop window lighting from Germany in which the top lighting is brought out over the pavement.

Lighting in the Wool Textile Industry

The textile industries were among the first to recognise the importance of good lighting. Though good lighting is by no means universal within the industry, considerable improvements have been made. The following article surveys the progress made within the last ten years in the wool textile industry.

By J. W. HOWELL,
D.L.C., M.I.E.E., F.I.E.S.

Introduction

For many years the textile industry had been composed of a large number of self-contained units, built around family traditions, whose ideas of development, in so far as working conditions were concerned, were limited in many cases to good financial returns for a minimum capital outlay. In consequence wages were low, mills often maintained at a minimum cost with employees mostly drawn from the village built around the mill. It was, in fact, expected that the whole of the employable population would become employees of the village mill-owner, and as a result there was no competition for labour and no necessity to do other than comply with existing legal requirements.

As in many other industries, conditions have changed with the changing times. Now we have mills tastefully decorated with planned lighting, premises in which both management and workers take an understandable pride.

The following statement taken from a publication* of the Wool (and Allied) Textile Employers' Council can be taken to indicate the change of mind which has taken place in the industry within 10 years:—

> "In the view of the progressive members of the industry, the provision of good working conditions is a vital part of an efficient production background. In the days of competition which be ahead, anything that will increase production efficiency is worthy of more than casual study.
>
> "Any system of lighting or factory improvement which increases output can be regarded as a labour-saving device—a production tool—no matter how detached it may be from the actual manufacturing process and as such can be calculated to pay for itself over a given period."

This publication was, in effect, a reference prepared for executives in the industry who had visited a "Light and Colour" demonstration in the spinning side of the industry carried out on an actual productive plant, the results of which can be seen by any casual observer to-day.

Concurrently with the demonstration the Council sponsored a lighting display and a series of special lectures given by the Lighting Service Bureau which attracted an attendance from those visiting the installation. It was not long before the results were apparent, demands for improved conditions coming from all sections of the industry.

Spinning

One has to bear in mind that many textile premises, particularly on the spinning side, are old with a good deal of line shafting and overhead belting, although it is gratifying to notice a marked tendency to install individual drives, thus dispensing with overhead

* "A New Light on Wool Textile Production," R.E.T. Dept., Wool (and Allied) Textile Employers' Council.

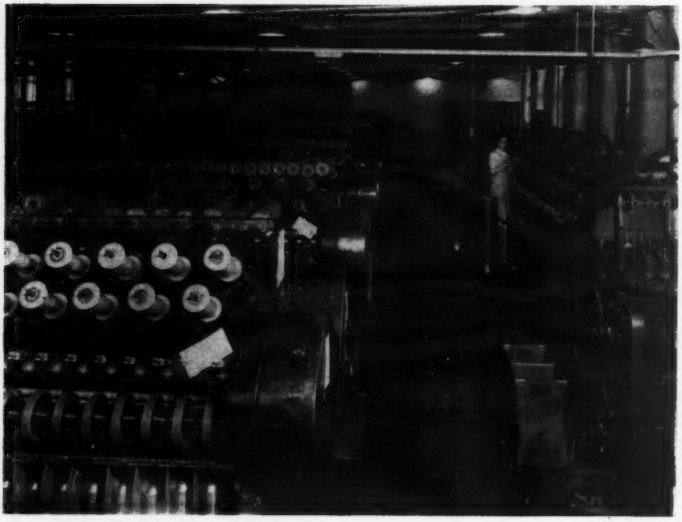


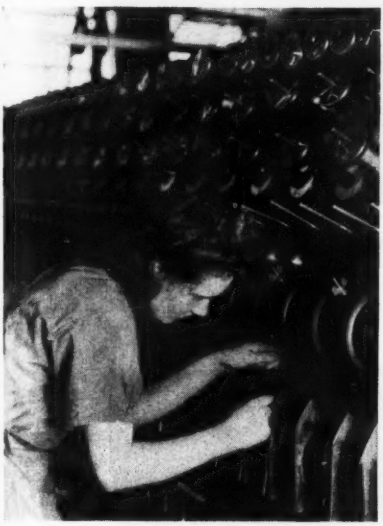
Fig. 1. Ring-spinning shed with traditional grey machinery in dark surroundings before relighting.

obstruction. The industry was well aware that difficulty was being experienced in obtaining operatives for the spinning processes, apparently because it was the lowest paid section of the trade and also due to poor working conditions. Fig. 1 is a photograph of the demonstration installation, which is a typical ring-spinning shed in the Bradford area, at that time considered fairly well lit, although with traditionally grey machinery in dark surroundings. Here the lighting scheme was re-designed, 80-watt daylight lamps being

Fig. 2. The ring-spinning shed shown in Fig. 1 after relighting and redecoration.

installed, whilst at the same time coloured paint was applied to the walls. Up to this time walls had been white-washed, reflection factors varying according to the blue introduced into the wash. Fig. 2 shows the change which took place, and it will also be noted that the machinery had been treated with colour. The results showed that for a very small increase in wattage, the level of illumination was raised from 8 to 18 lm./ft.^{2} a fact noted in the Council's brochure previously referred to. The result of the demonstration and the publicity it received was that in addition to the increase in output amounting to no less than 10 per cent., a shed without the operative's knowledge. One can well appreciate that under the conditions in Fig. 3 considerable fatigue would be experienced by the worker at the end of the day, whilst in Fig. 4, where the work was carried out under better seeing conditions, the nervous strain of the operative would be much less evident.

So far we have concerned ourselves with the actual "sowing of the seed" carried out it is true on a productive plant, but it is equally interesting to examine the "seed" germinating in other sections of the trade. We can only select from the numerous excellent installations one or two



Figs. 3 *and* 4. *Showing how the improved lighting in Fig.* 4 (*right*) *eases the strain on the worker engaged in detection of broken threads.*

hitherto short of labour found it necessary to keep a waiting list of spinners applying for employment.

It might be thought that in a process so highly mechanised as spinning little visual effort would be required, whereas speedy detection of broken threads is essential. Where dark threads are being processed and where in addition machinery is also dark in colour the concentration by the operative is at once apparent. The next two illustrations, Figs. 3 and 4, show clearly the same operative working under the old installation and under the new, both photographs having been taken outstanding cases which are typical of the new outlook.

Carding

Woollen carding plants are large and bulky, taking up a great deal of space, the "engines" being some 6 ft. high and presenting problems peculiar to themselves. In older plants, the alleyways between carding "engines" is very restricted, driving mechanisms being on the sides of the machinery, consisting of gear wheels, pulleys and belting in many cases quite unprotected. Consequently a journey down

Fig. 5. Carding plant with modern system of lighting.

the 3-ft.-wide passageway between adjacent "engines" is not without some risk and could be nerve-racking to the casual visitor. Good lighting is essential in these alleyways, not only for personal safety, but to allow maintenance of the driving gear. The process is one in which washed and dried wool is fed into hoppers from where, by means of various rollers, it travels the whole length of the machine, being

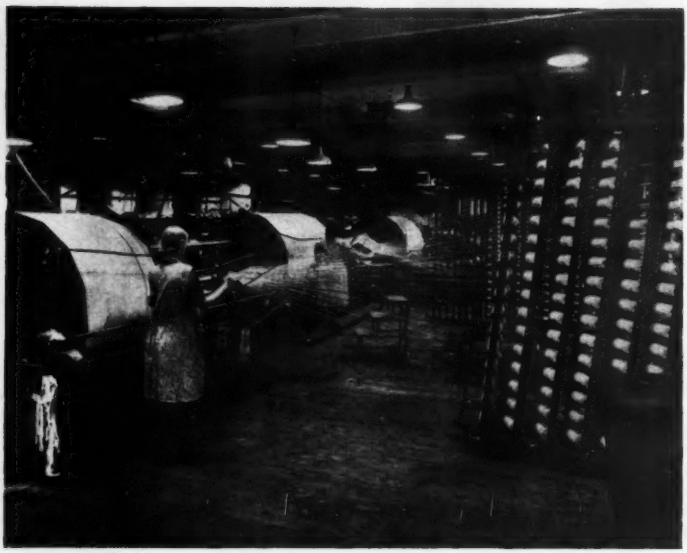


Fig. 6. Modern tungsten installation for warping machines.

delivered at the condenser end in the form of thick "thread" wound on to condenser bobbins. It is necessary that good visibility be ensured on top of the "engines" so that the cutters can be observed, but there must be no possibility of broken glass or any other foreign matter entering the cutters and causing serious damage thereto. In the main the process has not been well illuminated, and in many cases conical iron shades or even bare lamps were common.

Fig. 5 shows a modern plant lit by 80-watt tubes in slotted units providing excellent seeing conditions. In this case, as one frequently finds, an average of 12 lm./ft.^{2} is provided although the I.E.S. Code recommends only 7 lm./ft.^{2}.

Warping

Warping is a process making greater demands on vision than spinning or carding. It consists of preparing the warp by drawing threads from multitudinous bobbins mounted in creels, as shown on the right of Fig. 6. Hundreds of threads are drawn through reeds, and by means of a horizontal traverse are wound on the warping machine in the form of a layer of threads. Obviously if all the bobbins are rotating, thread is being wound, so that it is essential for the creel to be well illuminated, so that the bobbins can be kept under observation. A break, which must be detected at once, may occur at the point where thread passes through the "gatherer-in," just by the operative's hand, and it is here the maximum illumination is required. In some cases sight boards are fitted to the end of the creel in such a way as the warper in the normal working position can watch the threads leaving the creel and stop the machine before the thread is drawn into the "gatherer-in," where if a break occurs a rethread is necessary. Lighting for this process must necessarily be somewhat localised and concentrated over the most vital point.

Our illustration shows a recent tungsten installation giving an illumination of 16 lm./ft.^{2}. This can be taken as typical of the trend in the "preparing" end of the trade.

Weaving

Weaving processes, where the prepared weft and warp threads are woven into cloth, have always been given greater attention, although in many cases being still lit incorrectly.

Report No. 81 of the Medical Research Council did much to formulate better seeing conditions. Recommending a level of illumination of 30 lm./ft.^{2} when dark cloth is being woven, a standard was laid down which, coupled with the educational activity

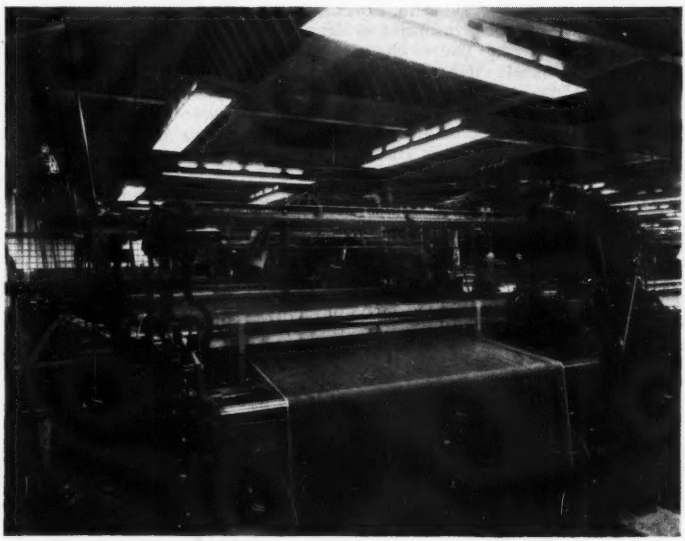


Fig. 7. Showing an installation using slotted troughs.

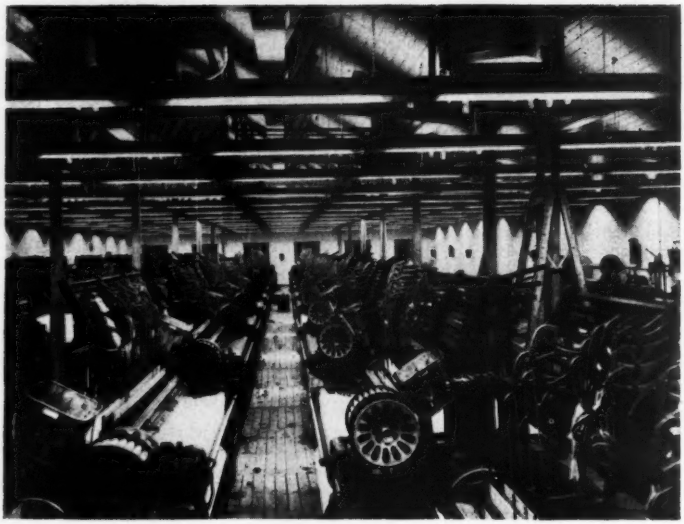


Fig. 8. Continuous fluorescent troughing in a weaving shed.

of the Lighting Service Bureau, aroused much interest. In view of the demand for more and more production for the overseas market, manufacturers became anxious to use every possible means of increasing and improving their output. In 1948 tests were carried out on rayon weaving in Yorkshire, where for the first time conclusive evidence was obtained proving that with properly controlled artificial lighting both the quantity and quality of the product were in excess of those produced under daylight. These tests have been permanently recorded in the Journal of the Textile Institute and are regarded as the standard reference for that process.*

It was found that using daylight fluorescent lamps with an appropriate lay-out, the most suitable level of illumination was 26 lm./ft.^{2}. It should be borne in mind, however, that the rayon was light in colour and also different in texture from woollens; nevertheless, the tests gave a clear indication that higher levels of illumination than those in use in woollens at that time were economically desirable.

Fig. 7 shows the layout referred to above, which, by the use of slotted troughs, avoids the dark area above the fitting and gives excellent seeing conditions at the three vital points. These are:—

The "sley," or going part, which pushes the warp thread into the weft at the front of the loom.

The heald shafts which can be clearly seen opening the warp threads to allow the shuttle which carries the weft thread to pass through the opening thus formed.

The warp at the back of the loom.

The view shown is the rear of a loom where the lamp is placed in line with the beam, at right-angles to the warp, each thread of which must be clearly visible to allow the speedy detection of knotted or otherwise faulty warp. The fittings at the front are over the weaver's "gate" and at right-angles to the weft threads, situated over the selvedge of the material. By this means adequate illumination, in this case 24 lm./ft.^{2} is obtained on the cloth face, whilst shadow caused by the "sley" or the shuttle guard is almost entirely eliminated, the electrical load being kept down to 150 watts per loom, which includes control gear losses.

Comparatively recently continuous troughing has been used to a considerable extent, and Fig. 8 shows a rather different kind of loom—Northrop Automatic—lit by this method. In this type of machine the weft

* "Experimental Lighting for Rayon Weaving." J. W. Howell. Journal Textile Institute Vol. XXXIX, No. 8—1948.

spools are fed into the shuttles automatically, increasing speed of operation and consequently output. Here, an illumination level of 26/32 lm./ft.^{2} has been secured.

Finishing

Burling and Mending

These processes are very exacting on the eyes. In the first place "burrs" (foreign substances) have to be removed by hand from the woven cloth whilst in the second broken threads have to be detected and renewed, often of different colours, and, of course, have to be inserted by hand. The task differs obviously with various cloths. Where patterned cloth lengths, such as tartans, are being examined, threads of many colours, some of which vary in shade only, lie side by side. In the case of a fault a new thread of precisely the same colour as the defective one has to be introduced into the cloth. Here a level of 50 lm./ft.^{2} is necessary and, in fact, is often used. It has been the usual practice for the light sources to be adjustable so that the mender can raise or lower them at will, but it is very debatable whether this is good practice and one is forced more and more to the conclusion that fixed lighting designed to cater for the worst conditions is a more satisfactory solution. With adjustable lighting menders have been found to be using an illumination level of 100 lm./ft.^{2}.

Perching

Perching or final inspection is one of the most vital processes so far as lighting is concerned. Even to-day in many mills the percher will not perch by other than natural light and then only around midday. Following difficulties in the North American markets, there appears to be a widespread desire to find *the* lighting solution to discover all faults and it would be impossible in the course of this article to describe the many attempts being made to provide illumination levels up to 450 lm./ft.^{2} on the cloth. Tests are in progress at the moment to determine whether these high values are necessary, for faults can be detected at much lower levels.

Colour

In dealing with colour it is not only the scientific but also the aesthetic aspect which must be considered and the need for the co-operation of the architect, lighting engineer and colour specialist with the firm's maintenance, plant and personnel directors and, possibly, the safety and welfare officers, cannot be too strongly stressed. Much progress has been made during the last few years. In Fig. 8 the roof has been boarded in and ceilings and walls coloured pale cream; pillars are art green. It is, indeed, gratifying to see the outlook of mill managements undergoing a tremendous change. The old so-called white-washed walls with a dark brown dado (the latter, as the managements frankly admit, to stop dirty, greasy marks from showing) are gradually giving place to well-lit, bright interiors, changes which are possibly more marked in this industry than any other.

One mistake still common, however, is the use of glossy paint under the impression that it provides a surface less likely to hold dust and easier to clean. The result, as can well be imagined, is to produce specular reflection on walls and ceilings of all light sources, including daylight. Some mills, however, have followed the advice given over many years and by using eggshell finish have successfully overcome this trouble. It would be entirely wrong if this article were to convey the impression that all mills were equally progressive; unfortunately, this is not the case, but sooner or later the worst mills must follow suit if they wish to retain their operatives.

One is led to wonder when the drabness of the machinery will give place to brighter and more congenial colourings. The author is well aware of extensive tests which have been carried out in colouring machinery used in textiles and of the many disappointments which have been met. Until such time as a paint is produced which will withstand not only wear and tear, but also the action of grease and acids associated with the various textile processes, this must remain a dream of the future. It is uneconomic to paint machines in colour after they have been put into service and, therefore, only in those mills where new machinery is installed could changes in this direction take place.

So far, little seems to have been done with regard to flooring. Most floors are dark wood or cement, rendered even darker by the oil deposits from the wool itself. It is problematical whether we shall ever see in our mills floors made of light-coloured materials which will withstand wear and tear and by their improved reflection factor increase the lighting efficiency, but there is little doubt that managements and workers alike have become light and colour conscious.

Conclusion

To enable a more accurate assessment of progress in woollens to be made a survey is at present being carried out from which

(*Continued on page* 166.)

Lighting in the Manufacture of Mica Tape

By S. M. PHILLIPSON,* A.M.I.E.E.

From time to time special lighting problems arise which can be solved only by adaptation of existing techniques and equipment. One such problem, concerning the lighting in a mica tape manufacturing bay, was recently raised and this article describes how it was solved.

Manufacture of Black and White Mica Tape

During the manufacture of mica tape the operators find difficulty in distinguishing between overlapping transparent mica flakes (which are placed on a semi-transparent, varnished paper) and portions of the paper which may remain uncovered. Such gaps between mica flakes or uncovered holes in the mica flakes themselves may lead to electrical breakdown of a machine in which the windings are insulated with this material in the form of tape. Whereas in the various applications of black tape, several layers are used when insulating a coil, there are a few special applications where one or two layers only of white mica tape are used. If flakes in the white mica tape do not overlap, therefore, the likelihood of subsequent electrical breakdown is much greater than is the case with the black tape where more layers are employed.

The operators, known as Layers, each cover a certain area of the varnished tape, as it passes forward on an endless belt, with irregularly shaped mica splittings. Before the top paper is laid on to form a "sandwich" of two papers and a layer of mica, another operator, known as a Spotter, inspects the tape for complete coverage and places additional flakes where necessary.

The Lighting Problem

The visual task is a particularly arduous one in that the mica transmits light similarly to the varnished paper; it is, therefore almost indistinguishable under normal lighting—whether natural or artificial—from the varnished paper which forms the background. The lighting problem is to make the contrast between the mica flakes and the varnished paper as great as possible, so that the operators experience less fatigue and the occurrence of gaps between the mica flakes is reduced to a minimum.

Experimental Methods Considered

Measurements of the optical transmission of white light through the mica flakes alone and through the mica and varnished tape together were very similar. It follows, therefore, that however much light is made to fall normal to the surface of the tape (either from above or below) there is difficulty in seeing the gaps between the mica splittings or even the holes in the mica flakes themselves.

Many different light sources and techniques were considered in order to produce a satisfactory solution. Among these may be mentioned the use of monochromatic light (from a sodium lamp), light from a mercury vapour lamp, long and short wave ultra-

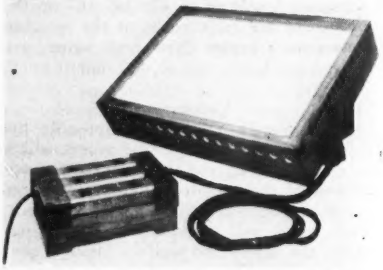


Fig. 1. *Illumination box used in preliminary experiments.*

* Research Laboratories, the British Thomson-Houston Co., Ltd., Rugby.

violet and polarised light. The U.V. produced fluorescence in the varnished paper but did so whether passing through the mica or falling on the uncovered paper.

Mica changes colour when oriented in front of a light polarised in one plane but the varnished paper depolarises this light so that colours are much less saturated and there is no gain in visibility.

Other methods considered but not undertaken included the alteration of the refractive index of the paper by adding a suitable agent to the varnish, and the application of a high voltage between the top surface of the mica sheets and the bottom paper—the object here being to break down the tape where there was a mica deficiency with the hope that such faults could be patched before the final processing of the mica tape.

The eventual solution of the problem was, as is so often the case, comparatively simple and resolves itself into two main sections:—

(a) *Reduction of Glare*

Reduction of direct glare from existing north-sky lights, windows and tungsten sources, and more particularly the glare of images of bright "point" sources in the mica flakes themselves.

(b) *Diffuse Illumination of Task*

The north-sky lights, windows and tungsten lamps may be considered to be "point" sources as far as the individual mica flakes are concerned, and they produce a jumble of confusing reflections in the surface of the mica.

By arranging for the operators to see the pieces of mica by the light *reflected* in them from a diffuse panel inclined at an angle over the mica tape, the images reflected from them are eliminated.

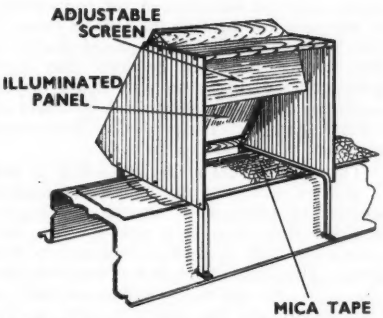


Fig. 2. Arrangement using the illumination box inclined over the mica tape.

A particular section of the tape normally dealt with by one operator is screened from all extraneous light sources. At the same time it is diffusely lit from an illuminated opal "Perspex" panel arranged in such a way that the mica in the hand of the operator, or on the tape, reflects some of this light and appears as a more or less evenly bright surface against the comparatively dark background of the operator's hands or the varnished paper.

From preliminary experiments using an existing illumination box (shown in Fig. 1) fitted with an opal "Perspex" panel and lit from behind by six 20-watt "daylight" fluorescent lamps, it has been found that an

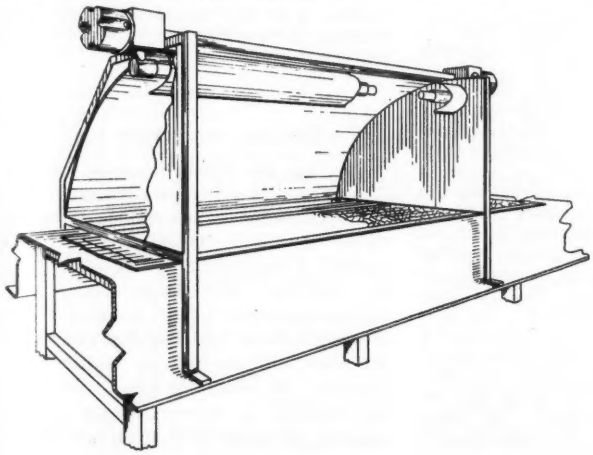


Fig. 3. Showing the trial model cubicle.

illumination of the order of 100 foot-candles is adequate for lighting the tape in front of the Spotter. It should be noted that it is the brightness ratio between the light reflected from the mica and that from its surroundings which determines the ease of seeing; mere increase in direct illumination does not help in seeing the task.

The arrangement is shown in Fig. 2, and it will be seen that the light from outside sources (windows and tungsten lighting) is shielded from the mica tape by two side panels, a roof, and the illumination box itself. The illumination box is inclined over the tape in order to reduce fall-off in illumination on the Spotter's side of the machine, and it is arranged so that it produces even flashing of the mica within the field of view of operators of average height. The operator's eyes are shielded from direct glare from the illuminated panel by a dense opal "Perspex" adjustable screen as shown.

In order to decrease the contrast between the brightness of the reflected light from the mica and the internal walls and the ceiling of the viewing cabinet, the walls and ceiling are painted with matt white paint and receive some illumination from the panel.

Obviously the experimental cubicle described above for use by the Spotter could be repeated for each Layer, but for economic reasons it has been decided in this particular case to have one Spotter's cubicle for each laying machine and allow the Layers to perform their task under the existing daylighting conditions, but with an improved level of general lighting for night work. The Spotter, therefore, assumes final responsibility of ensuring the efficiency of the finished product.

Though the initial lighting problem, as described above, has been solved, it is complicated by the fact that due to the solvents used for the varnished tape, flameproof equipment must be used in the building. To make an illumination box of this type flameproof the cost would be prohibitive and, therefore, it was necessary to design a cubicle using a standard flameproof lighting fitting. Such a cubicle is shown in Fig. 3. A standard 5-ft. 80-watt industrial fluorescent flameproof fitting with a special anodised aluminium specular reflector is mounted on an angle iron frame above the mica tape bench at the Spotter's position. The light from the lamp is directed by an adjustable reflector on to a curved, white-painted panel at the back of the cubicle, the reflection of this diffusing panel being seen by the Spotter in the mica flakes. The flakes are then visible against the comparatively darker background of the varnished tape. The object of curving the diffusing panel is to increase the uniformity of brightness of its surface. The white-painted end-panels and the diffusing panel screen the mica tape from extraneous light sources and thus prevent confusing reflections appearing on the surface of the mica flakes.

Nine months' operation with the experimental Spotter's cubicle has shown that the quality of the mica tape produced has been of a high standard and experience since gained with the trial model indicates that this high standard should be maintained.

The author wishes to thank Mr. L. J. Davies, Director of Research, British Thomson-Houston Co., Ltd., Rugby, for permission to publish this article.

Lighting in the Wool Textile Industry

(*Continued from page* 163.)

it is already evident that levels of illumination and concepts of colour application have surpassed what it was thought practicable to use 10 years ago. The survey being carried out with the co-operation of the Wool (and Allied) Textile Employers' Council will include at least 24 separate manufacturing plants and can be considered to give a fair picture of conditions in the industry generally. It is hoped that the results of this survey will be available towards the end of this year, but the results already obtained point to the fact that good lighting is at last considered to be indispensable to the industry in its drive for more and better production.

British Industries Fair

This year the British Industries Fair is to be held from May 5-16. The engineering and hardware section is, as usual, being held at Casfle Bromwich, Birmingham, where a number of firms in the lighting industry will be exhibiting their lamps, fittings and lighting equipment. Other products will be shown in London, including glass and plastics at Earls Court and scientific instruments at Olympia. An illustrated report on some of the exhibits of interest to the lighting engineer will be published in our next issue.

The Physical Society Exhibition

Overheard at South Kensington: "*Well, what do you think of the show this year?*" "*Oh, there seem to be a few more knobs to twiddle and a few more valves in each box, but otherwise it's much the same, I think, except that everyone seems to be taking an exaggerated interest in germanium.*"

This wasn't really quite fair. True enough the visitor was presented with an array of instruments, many of which seemed to be old friends from previous exhibitions, but still there was much that was new and of considerable interest to specialists in all walks of scientific life. The lighting specialist, as usual, had to search for his needles in the very large bundle of hay, but, when found, they were well worth the time and trouble taken in searching.

Flame Photometers

What is a flame photometer? This question was recently put to a number of experts in photometry and all, after some floundering and indulgence in more or less intelligent guesswork, had to confess that they did not know. Yet at the Exhibition no fewer than three firms were showing quite elaborate instruments under this name. Further research revealed that the instruments were designed for the rapid estimation of sodium, potassium or calcium in biological fluids. A dilute solution of the fluid is atomised and passed into a burner of special construction and the intensity of the characteristic radiation which results is measured photoelectrically. It was stated that an instrument designed by Messrs. Baird and Tatlock in collaboration with Mr. R. L. Warren, of the Courtauld Institute of Biochemistry, was able to detect one part in 10^8 of sodium or potassium. Other exhibitors of flame photometers were Evans Electroselenium, Ltd., whose instrument is shown in Fig 1, and Messrs. Hilger and Watts, Ltd.

Filters, Coloured and Neutral

There was an interesting exhibit of interference filters by Messrs. Barr and Stroud, Ltd. Filters can now be obtained which transmit only a very narrow band of wavelengths down to 20Å in width. Other filters are graded so that they transmit the different wave-lengths in the spectrum in order on passing from one end of the filter to the other. It has been proposed to use a filter of this kind, in conjunction with an appropriately shaped template, in a photo-electric photometer based on a principle similar to that of the instrument developed by Mr. Winch at the Wembley Research Laboratories. To attempt to meet the demand for a filter with uniform transmission throughout the visible spectrum, a special series of alloys has been developed, any one of which, when deposited on glass by the high vacuum process, gives a close approximation to neutrality. Percentage transmission is accurately controllable within a wide range. Variable density neutral filters have also been produced.

Photo-electric Cells

Photo-voltaic cells of various sizes and shapes were exhibited by Messrs. Sangamo Weston, Ltd., and by Messrs. Cinema-Television, Ltd. An outsize cell, six inches in diameter, was incorporated in a cosine-corrected illumination photometer intended for measuring very low values of illumination. This was shown by Megatron, Ltd., who also exhibited a number of photo-emissive cells with different spectral sensitivity characteristics. Both this firm and Evans Electroselenium, Ltd., showed direct reading colour-temperature meters by means of which the colour temperature of the light given by a lamp could be obtained very simply The instrument depended, in essence, on the ratio of the amount of light transmitted by a blue filter to that transmitted by a red filter, this ratio being determined with a photo-cell and microammeter of the kind used in the ordinary photo-electric illumination photometer. An objection to any such instrument is that it will always give a reading whether the light has a colour temperature or not, so that this question must be settled by some more fundamental method.

Another exhibit of interest to the lighting engineer was the collection of small ballasts for fluorescent lamps shown by

Salford Electrical Instruments, Ltd. They were stated in the catalogue to consist of a range of iron powder toroids specially developed for use in miniature control equipment used in conjunction with the fluorescent lighting systems of trains and road transport vehicles and in lightweight aircraft equipment. The ranges shown were suitable for primary supply frequencies of 400 and 850 cycles per sec. and for use with lamps of 10 to 50 watts. Their outstanding advantages were extreme compactness combined with low losses, negligible magnetic leakage and silence in operation.

The Baldwin Instrument Company, Ltd., again showed their vacuum cell photometer with the several attachments used to convert it respectively to a transmission densitometer, a reflection densitometer and an absorptiometer, while Hilger and Watts, Ltd., showed attachments for their Uvispek Spectrophotometer to enable a number of different types of measurements to be made with it.

Colour Measurement

The new Lovibond Colour Comparator shown in Fig. 2 was exhibited by The Tintometer, Ltd., who also had on view their recent publication, "The C.I.E. International Colour System Explained," a very useful description, in simple language, of the international system, written expressly for the non-technical reader. Perhaps the most interesting exhibit, however, was a prototype of a visual colorimeter employing the Lovibond red, yellow and blue subtractive primaries. This instrument was a modification of that shown last year, some changes having been made in the optical system. Graphs are provided for ready inter-conversion between the Lovibond and C.I.E. values. The instrument can be used for measuring the colours of self-luminous bodies as well as the more usual surface colours or the colours of transparent media.

From the Research Laboratories

The exhibits from the various research laboratories were again of great interest. The Siemens Research Laboratories showed their Spectral Band Photometer and Colorimeter, a full description of which appeared in *Light and Lighting* for April, and a brightness photometer—or should it be called a luminance photometer? In this, the surface to be measured is compared in a Lummer-Brodhun prism with a standard surface, the illumination of which can be varied by the movement of a reversing prism. The scale, which can be extended

Fig. 1. *Evans Electroselenium, Ltd.'s, flame photometer.*

by inserting neutral filters in the usual manner, is in foot-lamberts.

Both the B.T.H. Laboratories and the G.E.C. Laboratories showed the so-called "electroluminescent" light source. This consists of a sandwich in which the filling is a suitable phosphor, while the outer layers are the plates of a condenser. One of these plates is a sheet of glass with an inner transparent electrically conducting layer, whilst the other plate is a conducting layer of aluminium or other suitable metal applied as a backing to the dielectric material containing the phosphor. The phosphor glows when a suitable (usually fairly high frequency) alternating voltage is applied between the plates. The phenomenon is apparently being actively studied both here and in America because, although the efficiency is at present relatively low, such a source would undoubtedly have certain specialised applications. It is somewhat intriguing to think of a ceiling or walls so constructed that, at the turn of a switch, the whole surface could be made to glow evenly all over.

The other exhibit from the B.T.H. Laboratories which was of lighting interest consisted of a pair of demonstration model rooms with furnishings as in an ordinary sitting room of to-day. The rooms were illuminated by three fluorescent lamps of different colours, the intensity of each being variable at will so that the resulting illumination could be changed both in colour and in intensity over a wide range. The object of the demonstration was to find out how

colour preferences changed with the value of illumination provided. It was found that at low values a "warm" colour was generally preferred, whereas at high levels a "cooler" colour was considered more comfortable. This result confirms earlier experience with "Daylight" lamps which were often described as "gloomy" or "cheerless" when the illumination was of the same order as that commonly provided with tungsten lamps some 15 or 20 years ago.

An exhibit from the G.E.C. Research Laboratories which, like the electroluminescent light source, attracted a good deal of attention was an array of phosphors glowing in various shades of red and orange under the u.v. radiation from a mercury lamp. The matrix of each phosphor was of barium lithium silicate or strontium lithium silicate or an intermediate solid solution of the two with cerium or manganese as activator. The powders are strongly excited by the mercury 3650 and 2537 lines and an obvious application is to street lighting, using the powders (which are stated to have good temperature stability) on the inner wall of the outer envelope of an h.p.m.v. lamp.

The Colour Group Exhibit

Once again the Colour Group of the Physical Society staged a most interesting exhibit, though not perhaps on so ambitious a scale as last year. The theme on this occasion was the production of colour by physical means, and a great deal of ingenuity had clearly been put into devising and constructing apparatus which showed the basis of every conceivable method by which the physicist (or Nature) produces a colour. Interest in the exhibit was so great that many visitors, discouraged by the length of the queue of those waiting to go round, missed a really instructive and entertaining part of the Exhibition.

First there was a demonstration of the colours of thin films, and it was convincingly shown that the colour of the reflected light and that of the transmitted light were complementaries. Newton's rings were not omitted, and then came three examples of the phenomenon as it occurs in Nature. There was first a specimen of an oxidation film on metal, and then came an elaboration of the ordinary soap bubble, Boys' "rainbow cup," in which a flat film of soap solution is spun so that by centrifugal action the film becomes thicker at the edges than at the centre, and consequently exhibits all the colours of the rainbow in their natural sequence. A beautiful specimen of blue butterfly wing, at one time so fashionable in jewellery and in table ornaments, was then shown, and it was explained, by means of diagrams, how the lovely colour of the wing was produced by successive layers, or "plates," about 0.2μ (2000Å) apart.

Next there was an exhibit showing the basis of the Lippmann process of colour photography. This depends on the "standing waves" produced when the incident light and that reflected at the back of the film interfere at positions depending on the wave-length, and therefore on the colour of the light. (This process was referred to in passing by Mr. Davies in his lecture to be mentioned later.)

After an exhibit showing the production of colour by so-called "frustrated total reflection" there was a series of interference filters similar in principle to those exhibited by various manufacturers both last year and this. Such a filter consists of a sheet of glass as base, coated with a thin semi-transparent film of silver. This film is covered with a layer of some substance such as magnesium fluoride, the upper surface of which is coated with another thin film of silver. The thickness of the magnesium fluoride layer determines the wave-length of the light for which the transmission of the filter is a maximum, and, as explained earlier, by making the layer wedge-shaped a filter transmitting the different parts of the spectrum from one end of the wedge to the other can be constructed. A wedge filter of this kind was shown, as well as a case of filters transmitting light of different colours. The change of colour of the transmitted light as the angle of incidence of the light was altered could be seen quite clearly.

Next there was a demonstration of the colours produced when light is transmitted through a diffusing medium consisting of a number of fine particles in suspension, and the dependence of the colour on the particle size was shown.

The diffraction grating naturally featured prominently among the exhibits. The continuous spectrum produced from the light given by a tungsten filament lamp and the line spectrum given by mercury light were both strikingly shown, as well as the result produced by gratings crossed at right angles.

A very fascinating exhibit was that showing birefringent colours, i.e., the colours produced by double refraction in substances such as mica. Thin sheets of mica cut to various shapes were rotated so that as they crossed and recrossed each other a series of

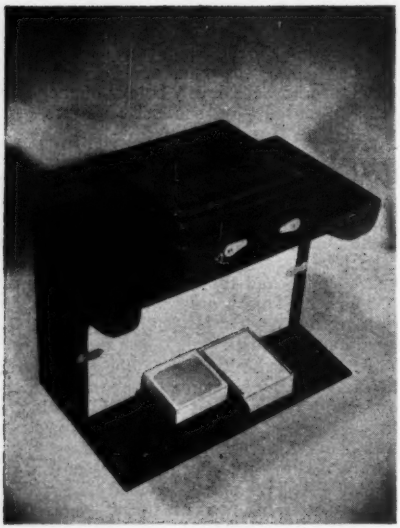


Fig. 2. New Lovibond comparator manufactured by Tintometer, Ltd.

beautiful colours was displayed. Then there was an exhibit showing birefringence in a sheet of viscose and a pattern made up of pieces of this substance, when viewed through a sheet of polaroid, gave the appearance of a Union Jack.

A very ambitious exhibit showed how the colours in a vivid sunset are formed by the scattering of the sun's rays in diffusing particles suspended in the atmosphere. The formation of the colours in the rainbow was also shown.

Finally there was a very interesting exhibit of Christiansen filters. These depend on the effect produced when light passes through a liquid containing a suspension of fine particles, if the refractive index of the particles is the same as that of the liquid for one narrow band of wave-lengths, but different for all others. The transmission is high for this particular band of wave-lengths, but much lower elsewhere in the spectrum, so that the filter can be used for isolating a narrow spectral region. The chief difficulty about the arrangement is that the wave-length of maximum transmission generally changes rather rapidly with change of temperature.

The Colour Group is certainly to be congratulated on its enterprise, and the members who assisted both in the arrangement of the exhibits and their demonstration deserve the grateful thanks of all who visited this part of the Exhibition.

Colour Photography

There were only two discourses this year, one by Mr. B. N. Wallis of Vickers-Armstrong, Ltd., on "Engineering Supersonic Aerodynamics," and the other by Mr. E. R. Davies of Kodak, Ltd., on "The Physical Basis of Colour Photography." Professor L. C. Martin, introducing Mr. Davies, said that, although most people looked on colour photography as more or less of a novelty, the fact was that in a few years' time we should be celebrating the centenary of the showing of the first colour photograph.

This fact was also mentioned by the lecturer who, after referring to the Lippmann process in which the colours of objects were actually reproduced as they existed, said that all other processes depended on the fact that almost any colour could be imitated by a suitably proportioned mixture of three elementary, or primary, colours. Maxwell had demonstrated this principle when, in 1861 at the Royal Institution, he projected colour pictures made by superposing the images of three transparencies which had been taken respectively through red, green and blue filters. The same filters were used in the projection, so that the original colours were reproduced on the screen.

Mr. Davies referred next to the "additive" process, such as Dufaycolour, in which three pictures, one red, one green and one blue, were intermingled in the transparency, the grain being so fine that the eye received the impression of a single picture in which the colours were produced by additive mixture. The "subtractive" processes were more numerous and in these the exposed and processed sensitive film contained three superposed transparencies coloured respectively cyan, magenta and yellow, the complementaries of the red, green and blue primaries. When light was transmitted through these three superposed images, the resulting picture appeared in its natural colours and there was much less loss of light than in the additive process.

Mr. Davies went on to explain how this simple process could be improved by the use of colour couplers and he mentioned the many factors which come into play when a colour picture is being viewed and which tend to compensate for imperfections in the fidelity with which the colours of the original objects are imitated in the picture.

Recent Street Lighting Installations

Preston

Strand Road, Preston, where 140 *sodium discharge lamps are used in Metrovick Top Entry "S.O. Fifty" lanterns on steel columns. This road is a very busy one particularly in the summer, when it carries very heavy traffic to and from Blackpool.*

Wakefield

Provision for alternative levels of illumination has been made in a recent street-lighting installation in the Bull Ring, Wakefield, where two of the three fluorescent lamps in the G.E.C. "Three Eighty" lanterns can be switched off after midnight. Optical control in these lanterns is obtained by means of "Perspex" refractor plates cemented to the inside of the enclosing "Perspex" bowl.

Crawley

The new town of Crawley, Sussex, is rapidly taking shape; modern design and construction methods being employed in all departments. This applies particularly to roadways and verges, where utmost safety combined with convenience for the user is provided. Lighting, therefore, plays a prominent part.

The photograph shows part of the trial installation of Siemens 2/40 watt fluorescent lanterns used for Class "B" lighting. These are mounted on "Tarslag" type 500 columns and brackets, the overall design (which allows for the lantern to be mounted at an angle to the roadway), being created in conjunction with Crawley Development Corporation.

London

Fittings and columns for the lighting installation in Parliament Square were specially manufactured by the Revo Electric Co. Ltd., from designs by Mr. Grey Wornum.

The main road fittings, for use with 1,500-watt tungsten lamps, comprise spun copper canopy with white reflecting surface and internal dome refractor with enclosed well glass. The bronze finished columns are of tubular steel and cast iron, and the height to light source is 25 ft.

A smaller fitting and column of similar design is used for refuge islands but in this case the fitting has no refractor and carries two 150-watt lamps. The height to light source is 15 ft.

The equipment was erected and installed by the London Electricity Board.

Lanarkshire

Several interesting street-lighting schemes have recently been completed along important roads in the Lanarkshire district of Scotland. Along the Glasgow–Carlisle and Glasgow–Cumbernauld roads, Mazda enclosed type lanterns with 140*-watt sodium vapour lamps are used. On the former highway (illustrated) the new sodium lighting is continuous for* 7½ *miles, representing the longest unbroken stretch of this kind of illumination in Britain. The lanterns are all mounted at a height of* 26 *ft. with an average spacing of* 120 *ft. Lighting intensity was recorded after* 1,000 *hours as* 1.85 *lm./ft.*^{2} *immediately under lamps and* 0.47 *lm./ft.*^{2} *at mid-span.*

*Mercury vapour lighting is employed along the A*776 *Hamilton–East Kilbride and the A*723 *Motherwell–Hamilton roads.*

Denmark

The Lillebaelt Bridge linking the island of Fuen and the mainland peninsula of Jutland is a fine example of bridge building, with an overall length of 1,178 *metres. Originally German equipment was used for the lighting of the roadway until it was found impossible after the war to obtain replacement parts. A completely new installation of Metrovick "Poplar" lanterns, using* 45*-watt sodium discharge lamps, has now replaced the former equipment. An interesting feature is the method adopted for mounting the lamps on the approaches to the bridge. Supports are used on one side of the roadway only with an unusually long overhang to bring the lamps above the centre of the carriageway,*

Lighting in an Irish Linen Factory

This article describes the lighting in a famous Irish firm's linen factory, the rebuilding of which has been recently completed.

Northern Ireland has a world-wide reputation for fine linen, and among its famous manufacturers the York Street Flax Spinning Co., Ltd., is one of the largest, if not the largest, in the world. For the past few years the company has been rebuilding their main factory largely demolished in the Belfast "blitz." The first section of new works and offices, completed last year, has been designed with a clean interior construction to provide the space, air and daylight that contribute towards carrying out efficiently the processes for converting the vegetable fibre of flax into fine linen.

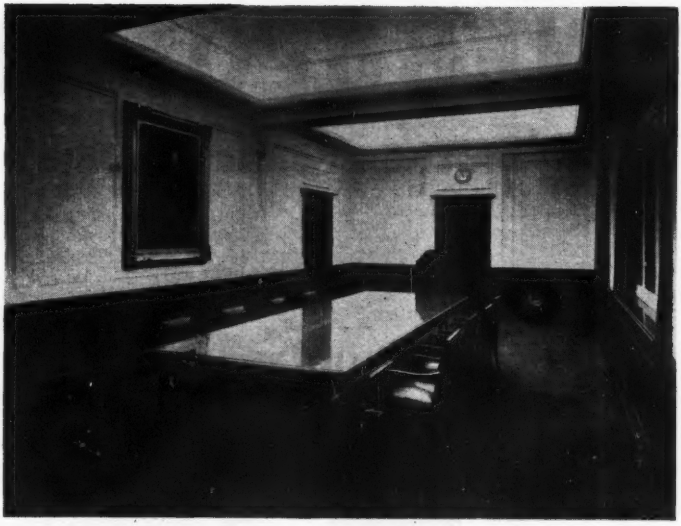
Although there is ample daylight under good weather conditions, it was necessary to install an efficient lighting scheme to supplement daylight when necessary and help towards comfortable full-speed working after dark.

The lighting scheme was planned by Crompton Parkinson, Ltd. Particular care was taken to select the most suitable types of lamps and fittings for specific work; fluorescent tubes are used in certain sections and filament lamps in others. For instance, in the inspection rooms, stillage areas are provided with filament lighting, whilst over the inspection benches fluorescent fittings are arranged to supplement fading daylight and to accentuate texture so that flaws may more easily be detected.

For the mesh knitting room the requirement was to ensure ample illumination and suitable brightness patterns over the areas of the needles to provide the lighting conditions essential to faultless speedy production. Correct lighting was achieved by a combination of localised low-level and general high-level arrangements of slotted-top reflectors with 80-watt "Natural" fluorescent tubes. The light from the low-level fittings merges with that from the higher-mounted general lighting over winding frames and stillage areas to avoid dangerous or annoying shadows; and there is also enough controlled upward illumination to prevent a depressing "tunnel" effect.

A different approach was made to the problems involved in lighting the offices, since here it was required to produce a lighting effect that would harmonise with the interior decoration. To maintain the sense of simple dignity achieved by the architect's design for the entrance hall, lighting is provided by Crompton "Anoliers" with 500-watt filament lamps, which give a totally indirect illumination. The same type of fitting was installed in the sales rooms to

View of the entrance hall, showing indirect filament lamp lighting.



Lighting in the board room by concealed fluorescent lamps.

give a quality of lighting that enhances the decorative scheme of a light ceiling and light-coloured walls brought down to a bench-level dado finished in fine panelling to floor level.

The requirements for the board room required the use of a very shallow recess formed by a deep moulding surrounding the room and forming cornices beside the beams. Indirect lighting was provided by anodised aluminium reflectors with 4-ft. and 5-ft. fluorescent tubes arranged to give acceptable brightness variation over the whole of the rectangular ceiling areas.

This lighting scheme was carried out by Crompton Parkinson, Ltd., in collaboration with Samuel Stevenson and Sons, Belfast, architects; F. B. McKee and Co., Ltd., builders; Mathew Hall and Co., Ltd., Belfast, electrical installation.

Mesh knitting room; showing localised low-level and general high-level fluorescent lighting.

NEBULOSITY*

*The state of being clouded

on the production line

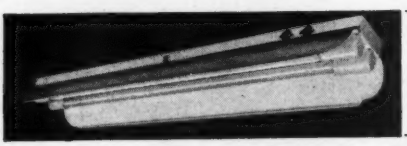
causes

SLOW OUTPUT · CARELESS WORKMANSHIP · LOW MORALE

NOBODY can be expected to do a good job when straining to see his or her work. That's why, in factories of every type, the installation of first-rate modern lighting equipment is nearly always followed by an increase in the quality and quantity of production. With Philips planned fluorescent lighting each worker has the right light for the job, a clear, glare-free light that makes everyone happy — management and operatives alike.

PHILIPS

Consult



Two 80w. 5 ft. Philips fluorescent lamps installed in the "Axbridge" fitting. Other suitable factory fittings: "Ardingley", "Alness".

PHILIPS ELECTRICAL LIMITED

on all lighting problems

LIGHT GROUP · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · W.C.2

MAKERS OF: RADIO & TELEVISION RECEIVERS · "PHILISHAVE" ELECTRIC DRY SHAVERS, ETC.

(LD969)

Trade Notes

Traffic Signs

The motorist who is laboriously trying to decipher the message on a badly illuminated sign cannot concentrate the whole of his attention on the road ahead with consequent risk of accidents. FRANCO TRAFFIC SIGNS, LTD., have produced a new lighting fitting which illuminates signs very distinctly making them readable at greater distance. There are two sizes of the new fitting, one 31 in. wide and a smaller fitting 16½ in. wide. Each fitting incorporates a 30-in. cold cathode fluorescent lamp which, in the case of the smaller fitting, is bent double. These are the first such signs to use cold cathode lamps. The current consumption is less than 60 watts and, due to the long life of the lamps (10,000 hours), maintenance is reduced to a minimum.

Lampshades

KNIGHTSHADES, LTD., announce the use of a new lampshade material known as "Nylux." Owing to the ease with which this new material can be made up, the price of shades is very much cheaper than those using other materials. "Nylux" is very much like silk in appearance and is washable and unshrinkable and is not affected by the heat of the lamp.

New illuminated traffic sign manufactured by Franco Traffic Signs, Ltd.

Circular Fluorescent Lamps

The members of E.L.M.A. are marketing a circular fluorescent lamp of a type which is a complete innovation. The gap between the ends of the lamp is filled by a special four-pin cap, the circle thus being a completely closed one; the photograph shows this important feature very clearly.

The lamp is the result of laboratory research by E.L.M.A. members, its manufacture requiring new techniques, particularly in sealing and glass bending. It is rated at 40 watts, the necessary auxiliary gear (switch start) being that already in use for straight 4-ft. 40-watt lamps of the same rating. A special holder for the four-pin cap has also been produced.

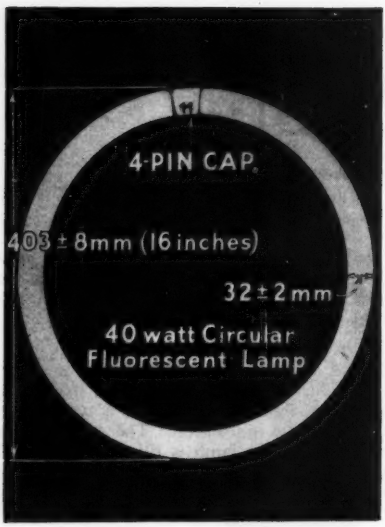
The available colour will be mellow, and, as the lamp will lend itself to fittings of a compact design, it will be particularly valuable for the illumination of restaurants and public rooms in hotels and ships, for shops, theatres, banks and other places frequented by the public where the decorative aspect is always important. For the same reason it should popularise the use of more fluorescent lighting in the home.

The list price will be 35s. (plus tax) and the marketing date July 1, 1952.

Tungsten Lamps

The E.L.M.A. members propose making 60-watt General Lighting Service Lamps (single coil and coiled-coil) in the smaller-size bulb used for the 40-watt lamp. After consultation with the Electric Light Fittings Association, E.L.M.A. has approached the British Standards Institution with a view to making standard the 60-watt lamp in the new size. Tests have proved that the present high standard of efficiency will not be affected.

The change which it is proposed to effect



Circular fluorescent lamp recently produced by E.L.M.A.

later this year will enable E.L.M.A. members to increase efficiency of production and distribution, since the smaller dimensions mean economy in raw materials and in packing space. This latter is an important consideration to the trade and to users in this country and from the point of view of shipping space for lamps sent overseas.

Trade Literature

FALK, STADELMANN AND CO., LTD.—New catalogue (No. 792-52) giving full details and prices of outdoor, industrial and display lighting fittings.

TUCKER AND EDGAR.—Folio of information sheets on "Teeanee" lighting fittings for general interior use.

GENERAL ELECTRIC CO., LTD.—Leaflets, including price lists on (a) 4-ft. and 5-ft. fluorescent fittings and Osram fluorescent lamps and control gear, and (b) coloured and ordinary floodlights.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—Recently issued catalogue (No. 998) dealing with Sieray fluorescent fittings and List No. 1008 on Sieray fluorescent lamps.

SIMPLEX ELECTRIC CO., LTD.—New price list for Lundberg accessories, including details on new items recently added to it.

FRANCO-BRITISH ELECTRICAL CO., LTD.—Leaflets on "Doffluor" diffusing screens and "Prismalux" fittings.

Just Published

Principles of Lighting

By W. R. STEVENS, B.Sc., M.I.E.E., F.I.E.S.

(Research Laboratories, The General Electric Co., Ltd.)

Demy 8vo. 468 pages. Illustrated. 35s. net

The purpose of this book is to describe the principles underlying different types of lighting installation and to exemplify them by current good practice. The earlier chapters cover, in a compressed form, the bulk of the information on such matters as photometry and colorimetry essential to the engineer in his work on design. The rest of the book deals with lighting method, generally under the headings of different situations, as, for example, offices, stores, factories, schools, workshops, etc.

"Electrical engineers who wish for a broad introduction to lighting theory and the modern methods of its application have little need to look further than this excellent volume."—*Electrical Times*

"Should be in the library of every engineer concerned in the practice of illumination."—*Electrician*

"Those who looked for an outstanding book on illuminating engineering from Mr. Stevens will not be disappointed. It is, in fact, difficult to praise it too highly."—*Light and Lighting*

Detailed prospectus on application.

CONSTABLE & Co., Ltd

10 ORANGE ST., LONDON, W.C.2

Correspondence

Report on C.I.E. Meeting

To the Editor, LIGHT AND LIGHTING

Sir,—Mr. C. W. M. Phillips's reported suggestion (*Light and Lighting*, January, 1952, p.36) that I should like "to see such matters as the subjective appraisal of brightness reduced to some selling slogan" cut me to the heart! Actually, despite his declaration about joining issue with me on lighting research, it seems apparent from his subsequent remarks that he and I see more or less eye to eye. My plea at the Stockholm Conference of the C.I.E. for greater recognition of the gap between the research worker and the practising lighting engineer is echoed in Mr. Phillips's words, ". . . I do suggest that our Society might consider finding some way of ensuring close and constant collaboration between those engaged in fundamental research problems and those who practise in the field. . . ."

For those of us whose work is largely concerned with the interpretation of research for the practical man this is a very real problem. It is no reflection on the hard-worked technical staffs of the commercial houses and electricity authorities and the other people concerned with the strictly practical side of illuminating engineering that they should not be able to keep completely in touch with developments on the research front. The more conscientious of them make a manful effort to breast the tide of current technical literature, but there seems little doubt that the average lighting engineer is aware only in the vaguest way of the trend and results of research, and it seems the very antithesis of realism to expect him, as Mr. Phillips puts it, "to interpret for himself in his everyday lighting activity the results of this fundamental type of work." Architects will tell you that what they need more than anything from building research is information presented in such a way that it can be readily applied to their design problems. This is precisely what the practising illuminating engineer needs from lighting research.

It would be interesting to know how many lighting engineers, in the two decades following publication in 1926 of L. L. Holladay's classic paper on Glare and Visibility, realised its potentialities as a key to the quantitative assessment of lighting quality. Very few, I venture to suggest; and those who made any use of his formula and "comfort ratings" in design would be still fewer. Not until Dr. Ward Harrison's paper on Glare Ratings appeared in 1945 did Holladay's invaluable contribution to lighting science begin to have a practical meaning for the engineer. I suggest that Harrison's paper and later elaborations of it are significant not primarily as an addition to the research data on discomfort glare, but because they provide a systematic tabular framework for presenting reference data in a way in which they can really be used.

In making these remarks I am not forgetting that much water must flow under the bridges before we have all the answers to comfort problems. Work planned by Hopkinson, Guth, Vermeulen and others can be expected to add very greatly to our basic knowledge in this field. But I feel it cannot be too strongly emphasised that it is no use telling a lighting engineer who has to start designing an installation to-day that, if he likes to wait for three or four years, there will be much more reliable data available than at present. He needs, and needs straight away, the best information now to hand. Research workers naturally do not want their work to "go off at half-cock" and are suspicious of any proposals for the practical application of interim results. But even if the only data which may happen to be available are tentative or incomplete, at least they represent the best information obtainable at the time, and information, moreover, which may be of great value to the lighting industry.

Nor am I overlooking the obvious dangers in the other directions. In a discussion on a paper by Luckiesh and Guth (Brightness in the Visual Field at Borderline between Comfort and Discomfort, *Illuminating Engineering*, November, 1949), H. L. Logan said: "The engineer is always under the temptation to take material of this kind and immediately use it, not only for all it is worth, but for more than it is worth. Scientists, like the authors, are the first to deprecate such 'extrapolation.' To guard against it they carefully state all the restrictions surrounding it, but the engineer, whose work will not wait, is inclined to disregard the limitations. This leads to delusionary conclusions; conclusions which may be true

in the restricted laboratory sense, but are false-to-reality in their general application. The results of activity of this nature can be seen in installations all over the country." But is not this kind of situation inevitable if the engineer is left to do the interpretation of research for himself?

It is characteristic of the born research worker that he is more concerned with the pursuit of the unknown than with the utilisation of his findings. In the realm of fundamental scientific research this is as it should be; but I believe that in any field of applied research the investigator must realise that his goal is the production of information that can be used, and that the success of his work is measurable by the extent to which his findings are applied. Those who attended the Stockholm sessions on Natural Daylight will remember Professor Arndt's somewhat exasperated protest about a paper on daylight factors: "Aren't we giving ourselves too much of a headache in worrying about new methods of defining and measuring daylight factors? We ought to be thinking more about giving data to the people who need it—the architects." The same kind of remark could be made with justification in many other technical fields.

Perhaps it is asking too much of the research worker to translate his findings, unaided, into the form in which they can best be used. Very often he can only dimly appreciate the needs of the designer. Ideally, I suppose, the job is one which should be tackled on a team basis, with both sides represented. But however it is done, I believe that the overall benefit to the art and science of illumination would be considerable if only a fraction of the effort and ingenuity devoted to research were diverted to the continuous and effective interpretation of the results for practical application. Surely this would amount to more than looking for "some selling slogan."—Yours, etc.,

A. L. BRENTWOOD.

Melbourne, Australia.
March 7, 1952.

To the Editor, LIGHT AND LIGHTING

Street Lighting

Sir,—Dr. Von der Trappen's article on street lighting in Germany in the February issue of LIGHT AND LIGHTING rather indicates that practice in that country is not so hidebound to convention as we are here. Indeed, it is interesting to note that some installations are on rather similar lines to certain pioneer work in this country, for instance, the much discussed installation in South-street, Eastbourne. In spite of the low brightness of fluorescent lamps, glare from the larger type of fluorescent multi-lamp lanterns can still be a source of annoyance and if glare is, to all intents and purposes, completely eliminated, then a considerable advance towards the ultimate street lighting installation is thereby achieved. Absence of glare is one of the main features of the Eastbourne installation and Dr. Von der Trappen quotes examples of installations in Germany where the light source is similarly placed parallel to the carriageway and where glare is very greatly reduced and visibility probably improved compared with the conventional arrangements with the light source at right angles to the carriageway.

The simple type of lantern shown in Fig. 3 of his article is most interesting, though it would be helpful to know of any difficulties experienced in starting the lamp in low temperatures together with information on the probable life of the lantern. I do not think, however, that local authorities or citizens with any pride in the daylight appearance of their town would welcome a battery of four fittings of this type suspended across the street.

Dr. Von der Trappen's objection to the open lantern appears to be mainly on the grounds of glare, but his suggested design of a fitting with low brightness is not far removed from many lanterns of conventional design in use in this country.

It is apparent that a maximum reduction of glare must be a major consideration in the design of future lanterns and information resulting from unorthodox installations at present in use both here and abroad should prove of considerable value.

B. C. OSSITT.

Eastbourne.

FOR SALE

Alternating Set for sale. Motor driven on baseplate. Input 70 h.p. 1,500 r.p.m. D.C. Output 400 volts, 1 phase, 50 cycles, 36 K.V.A. Starter panel with shunt regulator and A.C. voltmeter.—F. J. Edwards, Ltd., 359, Euston Rd., London, N.W.1. EUSton 4681.

REVIEWS OF BOOKS

"Glass and W. E. S. Turner." A volume containing articles by 20 contributors and edited by E. J. Gooding and E. Meigh. Published by the Society of Glass Technology, Sheffield, 1951. 144 *pp. Price* £1.

This book was a salute to the giant of glass technology, Professor W. E. S. Turner, on the occasion of his seventieth birthday, and it marks the indebtedness of the glass industry to his research work and his statesmanlike influence since the Department of Glass Technology was inaugurated by Sheffield University in 1915. This birthday tribute accounts for the personal and slightly florid language in some of the articles, but the historical value and the detailed reviews of some of the techniques and production rates in the glass industry are above question.

Twenty expert contributors have written articles on the fundamental science of glass composition and manufacture, on the melting processes with special reference to refractory materials and production methods, on the encouragement of art and design in glass making, and on the present British and international state of affairs in glass technology. The editors may be congratulated on welding this material into a consistent and consecutive whole. This is not a text book and, deliberately but regrettably, there is no index, but the reviewer was unable to find much reference to either lighting glassware or ophthalmic glass, both of which have shown remarkable developments during this period, due in part to Turner and his colleagues. Lamp bulbs and tubing are given as examples of the astronomical numbers and the minute accuracy of modern glass production.

One of Turner's greatest achievements is to maintain the Journal of the Society of Glass Technology, internationally regarded as of the highest standard of technical publications. In the early days much of this Journal was his own work or came from his immediate colleagues, and under his editorship it continued at the same high level. We wonder whether he can be persuaded to place on record the story of this Journal and the inspirations and sanctions which he has found necessary over the years.

This book is pleasantly printed and bound and it is easy to read, though the high gloss of the paper might be criticised by a glare-conscious lighting engineer. It may be confidently recommended to anyone wishing to become familiar with the background of the glass technology in this country.

J. G. H.

"Manual for the Illuminating Engineer on Large Size Perfect Diffusors," by H. Zijl. N. V. Philips, Gloeilampenfabrieken, Eindhoven, Netherlands, 1951. *Pp.* 196 + *ix, with* 120 *figures,* 49 *charts and* 3 *diagram sheets.*

The theoretical field of lighting provides full scope to those of mathematical inclination, and the author has clearly enjoyed immensely his excursions into this field. Unfortunately he has not made his journeyings quite so exciting to those to whom he would reveal this wonderland. Some items hardly warrant the space given to them, while in other parts the logic of the steps is not revealed; certain statements may mislead and the tyro will be confused by an occasional misprint. The matter will appeal to rather a small number, and the reading is not easy.

It is doubtful whether the data so fully portrayed will have wide application, for (as usual) it is based on the ideal perfect diffusor, and (as the author himself points out) in practice many approximations are permissible which simplify calculations greatly. In fact, probably the most useful section is the penultimate chapter, in which the acceptability of the approximation of replacing an extended source by a point source at its geometric centre is discussed (and recommended for most cases).

The law of reciprocity (Chapter 2), on which the majority of the book is based, is a very useful relationship which should be better known. The concept of tubes of luminous flux (Chapter 13), however, appears to introduce difficulty without any real advantage. The introduction to daylight calculations (Chapter 14) is rather woolly, but the application of the reciprocity law leads to an interesting technique. Some of the other applications appear to have been worked out from interest rather than usefulness. The formulae, curves, and charts are manifold. The main fault of the book lies in trying to be instructional as well as a manual; its real value is in setting old ideas in a new light and encouraging fresh thought instead of unquestioning acceptance of standard data and methods.

S. S. B.

"Electrical Phenomena at Interfaces," by J. A. V. Butler and others. Methuen and Co., Ltd., London. Price, 32s. 6d., pp. 309.

The subject dealt with in this book is the whole study of the electrical phenomena which occur at interfaces, in the field of chemistry, physics, and biology. It is an expansion of an earlier book by the editor and chief author, and includes chapters by authorities in their specialised fields.

The lighting engineer will find considerable interest in the first chapter, which examines the basic concepts of electrical potential differences at interfaces from historical and physical fundamentals. The rest of the book is for specialists, but those whose work leads them, however unwillingly, into the frontiers of physiology, will find some fascination in the chapters by W. F. Floyd on muscular potentials.

The lettering on the illustration of the Schlieren principle on page 108 does not seem to accord with the text, but one sympathises with the writer in his attempt to explain in two dimensions what is so readily grasped when one sees the apparatus itself.

The index is very brief for a work of such pretensions. Only a specialist could assess its adequacy, but it failed on a sampling test. In each case, however, it would be reasonable to assume that, failing to find the material under one heading, the specialist would look for it under two or three others, where it would be found. R. G. H.

"Introduction to Lighting," by Howard M. Sharp. Published by Prentice-Hall Inc., New York, obtainable through bookshops in this country, price $6.65.

This book is stated by the author to be the outgrowth of many years of experience in training men and women in the science of light and the art of lighting, and is claimed to give a workable appreciation and understanding of the majority of common lighting problems.

For American readers this claim is probably justified. The 329 pages adequately cover the elementary stages of 16 subjects—from nomenclature through lamps and gear, light control, luminaires, measurement, lighting design, vision, lighting applications and cost analysis, to mention only a few—in a more precise and concise manner than one often expects in transatlantic productions and the many explanatory line diagrams are very good.

Parts of the book, of course, refer specifically to American lamps, circuits and fittings which do not necessarily correspond with British types, and these sections thus lose some of their value to readers here. Little reference is made to work on brightness engineering or the inter-reflection method of design, but the author makes recommendations for maximum brightness in various zones for fittings used in offices, schools and some other interiors. Some of the definitions given do not agree with those of the C.I.E.

The text is well printed, but many of the half-tone illustrations do not do justice to the installations they portray.

A. A.

Recent B.S. Publications

British Standard for tubular steel columns for street lighting. (B.S. 1840: 1952.) Price 3s.

Guide to civil land aerodrome lighting. (B.S. 1332: 1952.) Price 3s.

Schedule for electric discharge lamps for general purposes. (B.S. 1270: 1952.) Price 2s.

Shop Window Lighting in Germany

The illustration on page 156, showing an example of shop-window lighting in Germany, is published by kind permission of "Lichttechnik." The interior window lighting is by one-metre long 40-watt fluorescent lamps; the lighting extending over the pavements is by cold cathode lamps housed in glass panels 60 cm. by one metre.

Corrigenda

We would apologise to readers and to the author for two errors in the article beginning on page 135 of the last issue and dealing with the new lighting at Guy's Hospital. The reference to Fig. 3, near the foot of the first column on page 135, should be deleted and subsequently figure references in the text renumbered 3 and 4. The figure in the second column of table 1 against "Light output in lumens" should read 2700, not 62700.

I.E.S. ACTIVITIES

London

At the Sessional Meeting held in London on April 8 a paper entitled "Luminescence as Applied to Lighting" was read by Mr. H. G. Jenkins and Mr. A. H. McKeag. The ordinary fluorescent lamp has made the phenomenon of luminescence a common feature of our everyday life. The important feature of this form of discharge is that about 60 per cent. of the total energy in the arc is radiated as short wavelength u.v. This accounts for the low luminous efficiency of the plain discharge and the high efficiency of the fluorescent lamp, in which a considerable fraction of the u.v. energy is transformed into light. Because the spectral quality of the fluorescent light can be closely controlled, a wide range of colours and colour rendering is possible from such lamps.

In the high-pressure mercury vapour discharge, on the other hand, most of the energy is emitted in the visible region and only a few per cent. in the u.v., mainly at 3650A. No worth-while gain in luminous efficiency can, therefore, be obtained by means of luminescence, but a material improvement in colour rendering can be achieved, particularly with modern red-emitting phosphors, with little or no loss in efficiency. The paper discussed the main features of photoluminescence as applied to these lamps.

An account was given of the theory of photoluminescence and the chemical, physical and luminous characteristics of the more important phosphors were discussed. Reference was also made to a number of general matters, including fluorescent glasses and organic and inorganic luminescent materials excited by so-called Black Glass u.v. sources or even by normal daylight. The interesting phenomenon of electro luminescence in which certain types of phosphor are excited by a varying electric field was briefly discussed.

Birmingham Centre

A large audience was present at the annual general meeting of the Birmingham Centre on March 14. On completion of the formal business a paper entitled "The Physical Principles Governing Fittings Design" was presented by Dr. W. H. Willott, a member of the Centre.

In presenting his paper he stressed the fact that he was dealing with the functional design of lighting units and not aesthetic and artistic appearance. He then proceeded to give a masterly review of the principles of reflection and refraction, illustrated by demonstrations and lantern slides. Dr.

At a recent successful London meeting a Brains Trust was held. Those participating were C. W. M. Phillips, S. S. Beggs, Kenneth Horne (Question Master), L. G. Applebee, and E. C. Lennox.

The I.E.S. President, the Lord Mayor of Liverpool, Mr. D. St. C. Barrie (Centre Chairman), and Mr. F. J. Burns (Centre Secretary), at the annual luncheon of the Liverpool Centre.

Willott then passed on to the materials used in construction, with particular reference to the many types of glass now in use. Finally he reviewed the design and manufacture of prismatic glassware and showed the wonderful progress that had been made in the design of lighting equipment for lighthouses. There was an interesting discussion, and the usual vote of thanks was proposed by Mr. J. W. Forth.

On March 28 the Birmingham Centre was fortunate in having Mr. G. J. Chamberlain, of the Tintometer Company, as a lecturer. His paper was entitled "Light and Colour" and was illustrated and augmented by a large number of effective demonstrations.

Beginning with a simple description of the radiation spectrum, Mr. Chamberlain then dealt briefly with the visible spectrum and its effect on the human eye, and followed with a short but lucid explanation of the subtractive and additive systems of colour mixing.

Liverpool Centre

At the meeting of the Liverpool Centre on March 4, Mr. A. Wilcock lectured on "Factory Lighting."

In his opening remarks Mr. Wilcock queried whether the minimum 0.5 lm./ft.^{2} recommended by the Factory Act for corridors and passages was sufficient from the point of view of safety. He continued by stressing the basic principles of the I.E.S. Code—the size of "the object of regard" and its relative contrast, etc.—considered various aspects of the field of

A group including the I.E.S. President, Mr. A. Ross (Centre Chairman), Mr. G. Comrie (Centre Secretary), and Dr. H. Buckley (Past President) at the Edinburgh Centre dinner.

application and the economics of tungsten, mercury, mixed and fluorescent lighting sources.

He laid stress on the necessity of paying great attention to the particular features needed to be considered in the manufacture of industrial fittings, e.g., robustness, sound construction of component parts and ease of maintenance.

Lighting schemes, said Mr. Wilcock, should always be designed to comply with I.E.S. Code and considered from both installation and maintenance viewpoints. He illustrated these aspects of lighting by a large and varied selection of slides; details of the particular application and technique employed in many installations shown were fully described. One point which did show itself to clear advantage in many of these slides was the great improvement to be derived by the consideration of "brightness engineering" principles.

Much of the value derived from the evening's lecture was due to the discussion to which many members of the audience contributed. Subjects raised included the question of flicker with fluorescent lamps in schemes where much moving machinery is in use, glare to neighbouring operatives arising from the use of local lighting sources, and many different angles of the maintenance of lighting installations.

A vote of thanks to Mr. Wilcock was proposed by Mr. C. Smith and seconded by Mr. T. W. Woods.

Sheffield Centre

On March 17 Mr. J. M. McEwing, of the Colour Advisory Department of Imperial Chemical Industries, lectured on "Interior Decoration and its Effect on Illumination."

He dealt first with the historical approach to the general use of colour, both for domestic and industrial use, and pointed out how during the present century an intelligent appreciation of the health-promoting properties of light, both natural and artificial, had multiplied many times the amount of window space that it was customary to use during past centuries. He said that the use of colour was a natural consequence of improved lighting standards.

For domestic interior decoration, Mr. McEwing recommended blends of pastel shades with the minor use of contrasting colours, the number of colours in use being limited to a maximum of three.

The painting of industrial interiors, he said, should similarly avoid harsh contrasting colours as far as possible, although in large machine shops and factory buildings the use of up to 10 colours would not be considered excessive if correctly blended.

A very interesting discussion ensued at the close of the lecture, Mr. McEwing replying to the points raised.

Newcastle Centre

This year the annual social function of the Newcastle Centre took the form of a Dinner-Dance which, for the first event of its kind organised by this Centre, was very successful. Mr. W. H. Dodgson, chairman of the Centre, in proposing the toast of "The Guests," said how pleased the Centre was that Mr. J. G. Holmes had not only continued the happy tradition of visiting the Centre as President but that he was also accompanied by Mrs. Holmes. Mr. H. Esther, vice-chairman of the N.E. Centre of the I.E.E., replied.

The toast of "The Society" was proposed by Mr. Clive Newcombe, President of the Northern Architectural Association. In the course of his remarks he referred to the recent criticisms of street lighting columns and pointed out that it was apparently easier to criticise than to produce new designs.

Mr. Holmes said he was much impressed by the activities of the Newcastle Centre and referred to the attendance and help given at Council meetings by Mr. Dodgson and Mr. J. S. McCulloch as Council members and by Mr. E. C. Lennox as a Vice-President. In reply to Mr. Newcombe he stressed that the Society was more than willing to understand the viewpoints of others interested in lighting matters, and in particular was most anxious to improve collaboration with architects.

Leeds Centre

At the Sessional Meeting in Leeds, on March 31, a paper entitled "Light and Sight" was presented by Mr. J. Benson, F.R.C.S. Mr. Benson discussed the object and functions of the eye, and dealt in detail with the aspects of visual acuity, with particular reference to complaints experienced by older people.

A brisk discussion was opened by Mr. J. K. Frisby, who asked if there was a standard illumination specified when an optician used test charts, and, if so, what method of attaining this was used. Mr. Johnson questioned the effect of T.V. viewing on the eyes, and Mr. Howell wished to know if Mr. Benson had any experience of windowless factories with relationship to eyesight. Others taking part in the discussion included Messrs. Edmondson, R. D. Green and Sewell.

The members present thoroughly enjoyed the delightful way in which Mr. Benson presented his paper and answered questions arising out of the discussion.

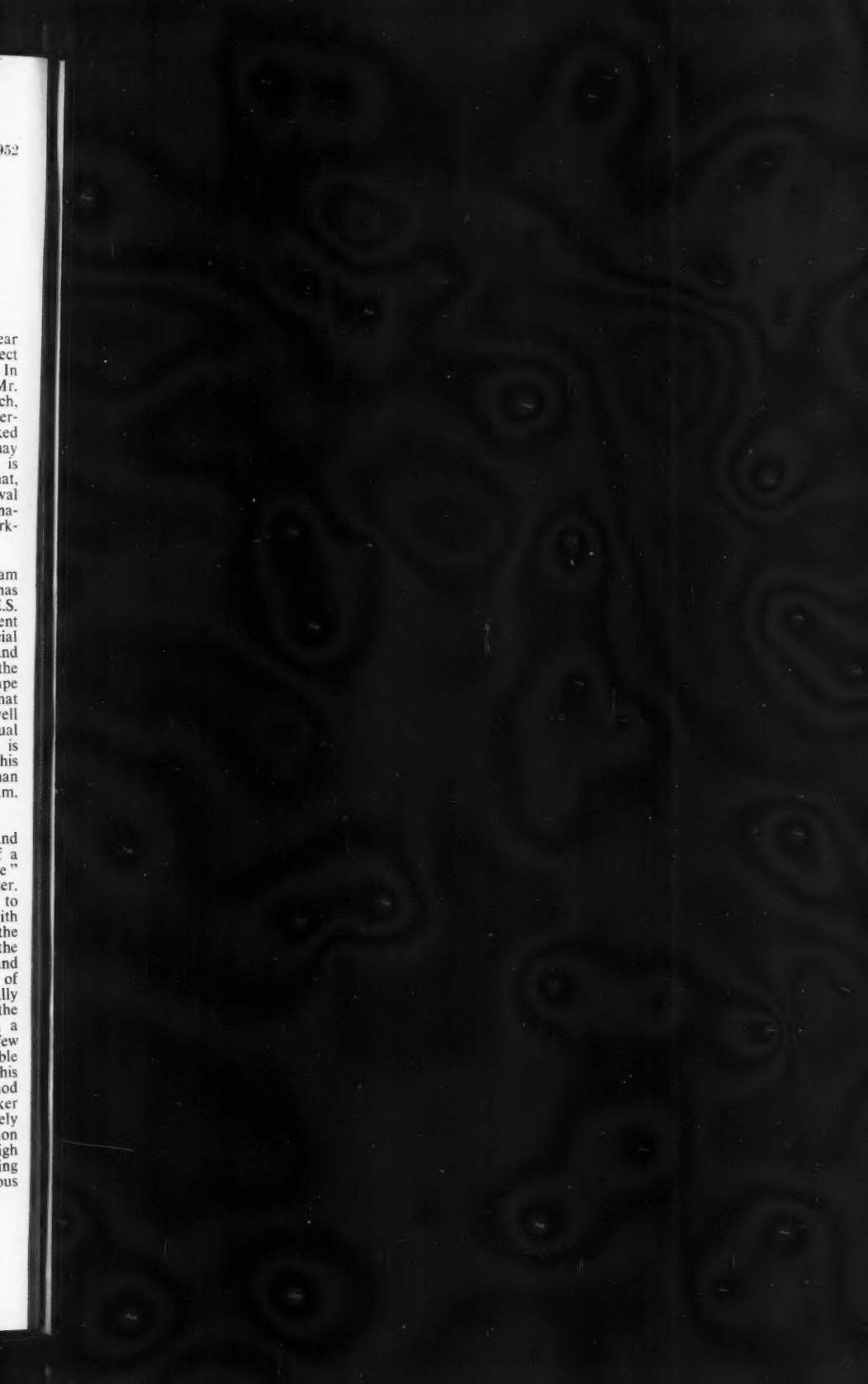
POSTSCRIPT

By "Lumeritas"

The last issue of this journal contained an unusual number of letters to the Editor, two of them being prompted by some remarks of mine in the February Postscript. "Dimwit," the doughty defender of "foot-candle," asks me to say why "a lumen per square foot is better than a foot-candle," but, forsooth, I cannot, for authorities, with one accord, agree that they are equal! Nevertheless, my dislike of "foot-candle" is undiminished. Had not the coining of some photometric terms occurred in the candle age, the foot might have been coupled with some other light source to yield an even more absurd term. How say you, dear Dimwit, would you defend or deplore the expression of illumination values in foot-fluorescent-lamps? You say you can see a candle but not a lumen. Are you not underrating your powers? You may not recognise a lumen when it hits you in the eye, but that candle you know *by sight* is no thing of wax and wick—it is only a pattern of lumens which you say you can't see! However, I do not like "lumens per square foot," I merely prefer this expression to "foot-candles." Nor do I like "foot-lambert" (horrid, hyphenated hybrid), nor "lumens-per-steradian-per-square-inch." From the latter "mouthful" a tidy little term could be formed and another (besides "lux") could be found to denote lumens received per unit area. Such would be my terms of choice, but there seems to be no general desire for them.

Another letter refers to the decision not to hold an inquiry into the terrible Chatham bus accident, which occurred in a badly lighted road. An opinion of an independent lighting expert of Mr. Cunnington's experience and standing has not been published hitherto, but, having seen the road under conditions similar to those prevailing at the time of the accident, he does not hesitate to condemn the lighting as quite inadequate for such a road. Is anything being done about it, and have lighting authorities in other areas been stimulated to do something about the black spots in their areas before other accidents occur? It is useless to bemoan the toll of the roads and at the same time to allow the survival of lighting conditions which are no longer suited to the traffic carried by certain roads.

Festival lighting in Oxford last year appears to have had an unexpected effect on the behaviour of the undergraduates. In his farewell speech, the Senior Proctor, Mr. A. G. M. Weddell, who retired in March, remarked that "the attitude of the undergraduates to the proctors has been marked by good sense and great humour. It may be that this mildly unusual phenomenon is in some way connected with the fact that, for part of the university year, the Festival floodlighting cast an unaccustomed illumination during the more lively hours of darkness."

My note, in March, on the Lewisham experiments in lighting Zebra crossings has brought a letter from a member of the I.E.S. drawing attention to another experiment which is being made in Croydon. A special floodlighting fitting has been designed and this is suspended over the centre of the crossing. The fitting is rectangular in shape and is striped like the crossing itself, so that it serves as a luminous crossing sign as well as a light source for illuminating the actual crossing and the pedestrians using it. It is claimed that for efficacy and cost this method of lighting crossings is better than any of the methods under trial at Lewisham.

Among the notices of equipment and appliances in the first number (April) of a new journal called "Laboratory Practice" is one describing a colour temperature meter. "In a matter of seconds it is possible to determine the quality of illumination" with this instrument. In the March issue of the American "Illuminating Engineering," the first article is entitled "Glare Factors" and it opens as follows: "Predetermination of illumination quality and quantity is vitally important. . . . Methods for determining the quality of illumination have been given a great deal of thought, but heretofore few methods have been put in a form available for general use by lighting people. This paper is intended to show that the method of glare factors by Harrison and Meaker is practical. . . ." Here are two entirely different connotations of the expression "quality of illumination"; is it not high time that the technical literature of lighting should be freed from this ambiguous expression?